Food Nutrient Analysis

Exploratory Data Analysis on Food Nutrient Data By Kamal Kumar Remalli

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [4]:
```
data=pd.read_csv("/content/food data csv.csv")
data
```

Out[4]:

	ID	Description	Calories	Protein	TotalFat	Carbohydr
0	1001	BUTTER,WITH SALT	717.0	0.85	81.11	(
1	1002	BUTTER,WHIPPED,WITH SALT	717.0	0.85	81.11	(
2	1003	BUTTER OIL,ANHYDROUS	876.0	0.28	99.48	(
3	1004	CHEESE,BLUE	353.0	21.40	28.74	2
4	1005	CHEESE,BRICK	371.0	23.24	29.68	2
...	...	...	...	...	...	
7053	80200	FROG LEGS,RAW	73.0	16.40	0.30	(
7054	83110	MACKEREL,SALTED	305.0	18.50	25.10	(
7055	90240	SCALLOP,(BAY&SEA),CKD,STMD	111.0	20.54	0.84	5
7056	90560	SNAIL,RAW	90.0	16.10	1.40	2
7057	93600	TURTLE,GREEN,RAW	89.0	19.80	0.50	(

7058 rows × 16 columns

EXPLORATORY DATA ANALYSIS

In [ ]:
```
data.head(10)
```

Out[ ]:

	ID	Description	Calories	Protein	TotalFat	Carbohydrate	Sodiun
0	1001	BUTTER,WITH SALT	717.0	0.85	81.11	0.06	714.0
1	1002	BUTTER,WHIPPED,WITH SALT	717.0	0.85	81.11	0.06	827.0
2	1003	BUTTER OIL,ANHYDROUS	876.0	0.28	99.48	0.00	2.0
3	1004	CHEESE,BLUE	353.0	21.40	28.74	2.34	1395.0
4	1005	CHEESE,BRICK	371.0	23.24	29.68	2.79	560.0
5	1006	CHEESE,BRIE	334.0	20.75	27.68	0.45	629.0
6	1007	CHEESE,CAMEMBERT	300.0	19.80	24.26	0.46	842.0
7	1008	CHEESE,CARAWAY	376.0	25.18	29.20	3.06	690.0
8	1009	CHEESE,CHEDDAR	403.0	24.90	33.14	1.28	621.0
9	1010	CHEESE,CHESHIRE	387.0	23.37	30.60	4.78	700.0

In [ ]:

```
data.tail(10)
```

Out[ ]:

	ID	Description	Calories	Protein	TotalFat	Carbohydr
7048	44203	COCKTAIL MIX,NON-ALCOHOLIC,CONCD,FRZ	287.0	0.08	0.01	71
7049	44258	PUDDINGS,CHOC FLAVOR,LO CAL,REG,DRY MIX	365.0	10.08	3.00	74
7050	44259	PUDDINGS,ALL FLAVORS XCPT CHOC,LO CAL,REG,DRY MIX	351.0	1.60	0.10	86
7051	44260	PUDDINGS,ALL FLAVORS XCPT CHOC,LO CAL,INST,DRY...	350.0	0.81	0.90	84
7052	48052	VITAL WHEAT GLUTEN	370.0	75.16	1.85	13
7053	80200	FROG LEGS,RAW	73.0	16.40	0.30	0
7054	83110	MACKEREL,SALTED	305.0	18.50	25.10	0
7055	90240	SCALLOP,(BAY&SEA),CKD,STMD	111.0	20.54	0.84	5
7056	90560	SNAIL,RAW	90.0	16.10	1.40	2
7057	93600	TURTLE,GREEN,RAW	89.0	19.80	0.50	0

In [ ]:

```
data[40:50]
```

Out[ ]:

	ID	Description	Calories	Protein	TotalFat	Carbohydrate
40	1041	CHEESE,TILSIT	340.0	24.41	25.98	1.88
41	1042	CHEESE,PAST PROCESS,AMERICAN,FORT W/ VITAMIN D	371.0	18.13	31.79	3.70
42	1043	CHEESE,PAST PROCESS,PIMENTO	375.0	22.13	31.20	1.73
43	1044	CHEESE,PAST PROCESS,SWISS	334.0	24.73	25.01	2.10
44	1045	CHEESE FD,COLD PK,AMERICAN	331.0	19.66	24.46	8.32
45	1046	CHEESE FD,PAST PROCESS,AMERICAN,VITAMIN D FORT	330.0	16.86	25.63	8.56
46	1047	CHEESE FD,PAST PROCESS,SWISS	323.0	21.92	24.14	4.50
47	1048	CHEESE SPRD,PAST PROCESS,AMERICAN	290.0	16.41	21.23	8.73
48	1049	CREAM,FLUID,HALF AND HALF	130.0	2.96	11.50	4.30
49	1050	CREAM,FLUID,LT (COFFEE CRM OR TABLE CRM)	195.0	2.70	19.31	3.66

In [ ]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7058 entries, 0 to 7057
Data columns (total 16 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   ID            7058 non-null   int64  
 1   Description   7058 non-null   object 
 2   Calories      7057 non-null   float64
 3   Protein       7057 non-null   float64
 4   TotalFat      7057 non-null   float64
 5   Carbohydrate  7057 non-null   float64
 6   Sodium        6974 non-null   float64
 7   SaturatedFat  6757 non-null   float64
 8   Cholesterol   6770 non-null   float64
 9   Sugar         5148 non-null   float64
 10  Calcium       6922 non-null   float64
 11  Iron          6935 non-null   float64
 12  Potassium     6649 non-null   float64
 13  VitaminC      6726 non-null   float64
 14  VitaminE      4338 non-null   float64
 15  VitaminD      4224 non-null   float64
dtypes: float64(14), int64(1), object(1)
memory usage: 882.4+ KB
```

In [ ]:

```
data.dtypes
```

Out[ ]:

	0
ID	int64
Description	object
Calories	float64
Protein	float64
TotalFat	float64
Carbohydrate	float64
Sodium	float64
SaturatedFat	float64
Cholesterol	float64
Sugar	float64
Calcium	float64
Iron	float64
Potassium	float64
VitaminC	float64
VitaminE	float64
VitaminD	float64

dtype: object

In [ ]:

```
data.columns
```

Out[ ]:

```
Index(['ID', 'Description', 'Calories', 'Protein', 'TotalFat', 'Carbohydrat
e',
       'Sodium', 'SaturatedFat', 'Cholesterol', 'Sugar', 'Calcium', 'Iron',
       'Potassium', 'VitaminC', 'VitaminE', 'VitaminD'],
      dtype='object')
```

In [5]:

```
data = data.drop('ID',axis=1)
```

In [ ]:

```
data
```

Out[ ]:

	Description	Calories	Protein	TotalFat	Carbohydrate	So
0	BUTTER,WITH SALT	717.0	0.85	81.11	0.06	
1	BUTTER,WHIPPED,WITH SALT	717.0	0.85	81.11	0.06	
2	BUTTER OIL,ANHYDROUS	876.0	0.28	99.48	0.00	
3	CHEESE,BLUE	353.0	21.40	28.74	2.34	1
4	CHEESE,BRICK	371.0	23.24	29.68	2.79	
...	...	...	...	...	...	...
7053	FROG LEGS,RAW	73.0	16.40	0.30	0.00	
7054	MACKEREL,SALTED	305.0	18.50	25.10	0.00	4
7055	SCALLOP,(BAY&SEA),CKD,STMD	111.0	20.54	0.84	5.41	
7056	SNAIL,RAW	90.0	16.10	1.40	2.00	
7057	TURTLE,GREEN,RAW	89.0	19.80	0.50	0.00	

7058 rows × 15 columns

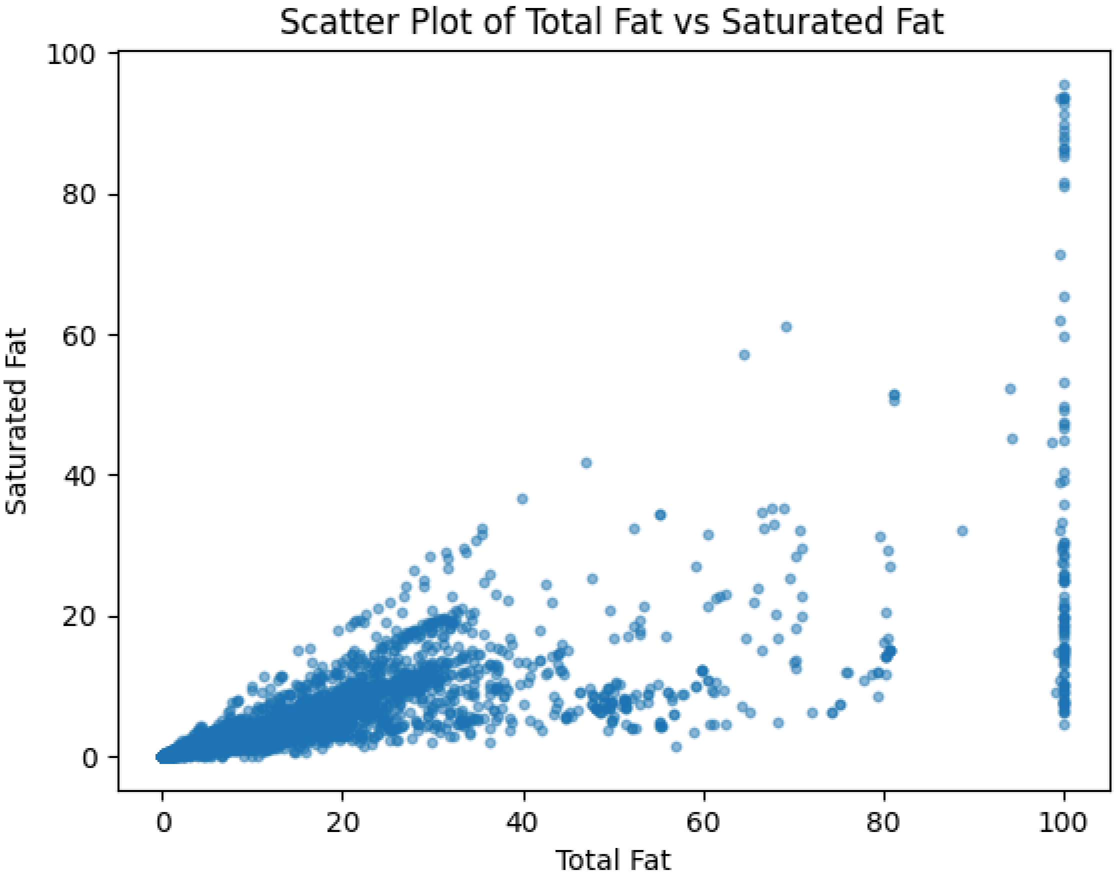
Data Visualization

In [ ]:

```
plt.scatter(data['TotalFat'], data['SaturatedFat'],s=10,alpha=0.5)
plt.xlabel('Total Fat')
plt.ylabel('Saturated Fat')
plt.title('Scatter Plot of Total Fat vs Saturated Fat')
```

Out[ ]:

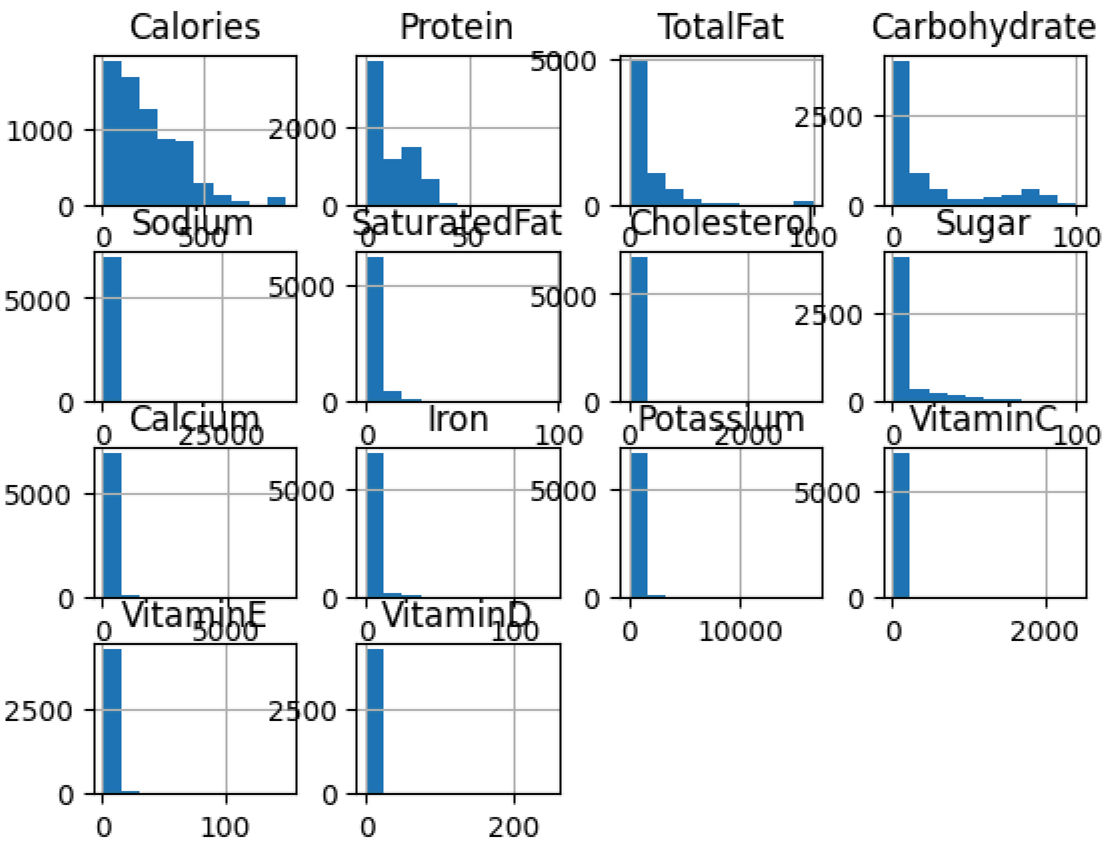
```
Text(0.5, 1.0, 'Scatter Plot of Total Fat vs Saturated Fat')
```



It shows a positive correlation between Total Fat and Saturated Fat

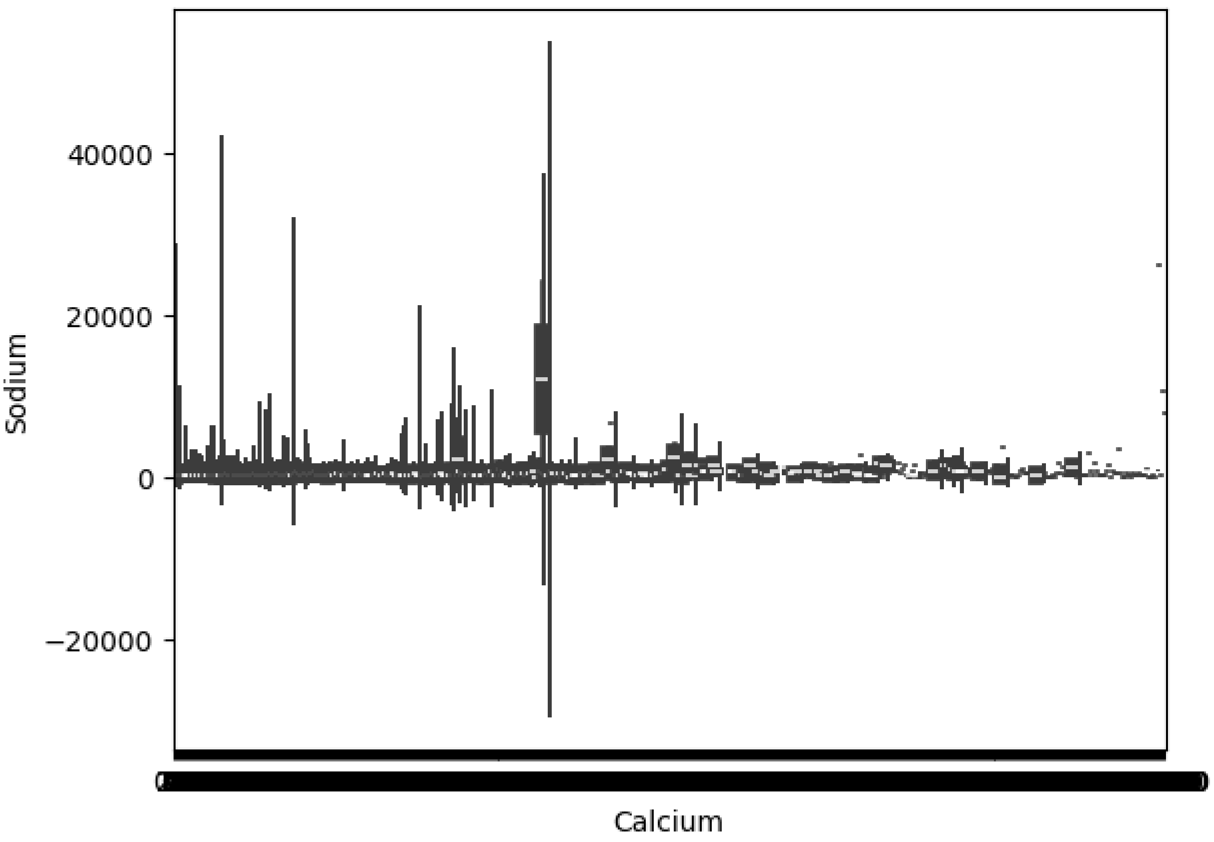
```
In [ ]: plt.figure(figsize=(10, 10))
        data.hist()
```

```
Out[ ]: array([[<Axes: title={'center': 'Calories'}>,
                 <Axes: title={'center': 'Protein'}>,
                 <Axes: title={'center': 'TotalFat'}>,
                 <Axes: title={'center': 'Carbohydrate'}>],
                [<Axes: title={'center': 'Sodium'}>,
                 <Axes: title={'center': 'SaturatedFat'}>,
                 <Axes: title={'center': 'Cholesterol'}>,
                 <Axes: title={'center': 'Sugar'}>],
                [<Axes: title={'center': 'Calcium'}>,
                 <Axes: title={'center': 'Iron'}>,
                 <Axes: title={'center': 'Potassium'}>,
                 <Axes: title={'center': 'VitaminC'}>],
                [<Axes: title={'center': 'VitaminE'}>,
                 <Axes: title={'center': 'VitaminD'}>, <Axes: >, <Axes: >]],
               dtype=object)
      <Figure size 1000x1000 with 0 Axes>
```



```
In [9]: sns.violinplot(x = 'Calcium', y = 'Sodium', data=data,split=True)
```

```
Out[9]: <Axes: xlabel='Calcium', ylabel='Sodium'>
```



In [12]:
```
df1 = data.drop('Description',axis=1)
df1
```

Out[12]:

	Calories	Protein	TotalFat	Carbohydrate	Sodium	SaturatedFat	Cholest
0	717.0	0.85	81.11	0.06	714.0	51.368	2
1	717.0	0.85	81.11	0.06	827.0	50.489	2
2	876.0	0.28	99.48	0.00	2.0	61.924	2
3	353.0	21.40	28.74	2.34	1395.0	18.669	7
4	371.0	23.24	29.68	2.79	560.0	18.764	9
...	...	...	...	...	...	...	
7053	73.0	16.40	0.30	0.00	58.0	0.076	5
7054	305.0	18.50	25.10	0.00	4450.0	7.148	9
7055	111.0	20.54	0.84	5.41	667.0	0.218	4
7056	90.0	16.10	1.40	2.00	70.0	0.361	5
7057	89.0	19.80	0.50	0.00	68.0	0.127	5

7058 rows × 14 columns

In [14]:

```
avg_values = df1.mean()
avg_values
```

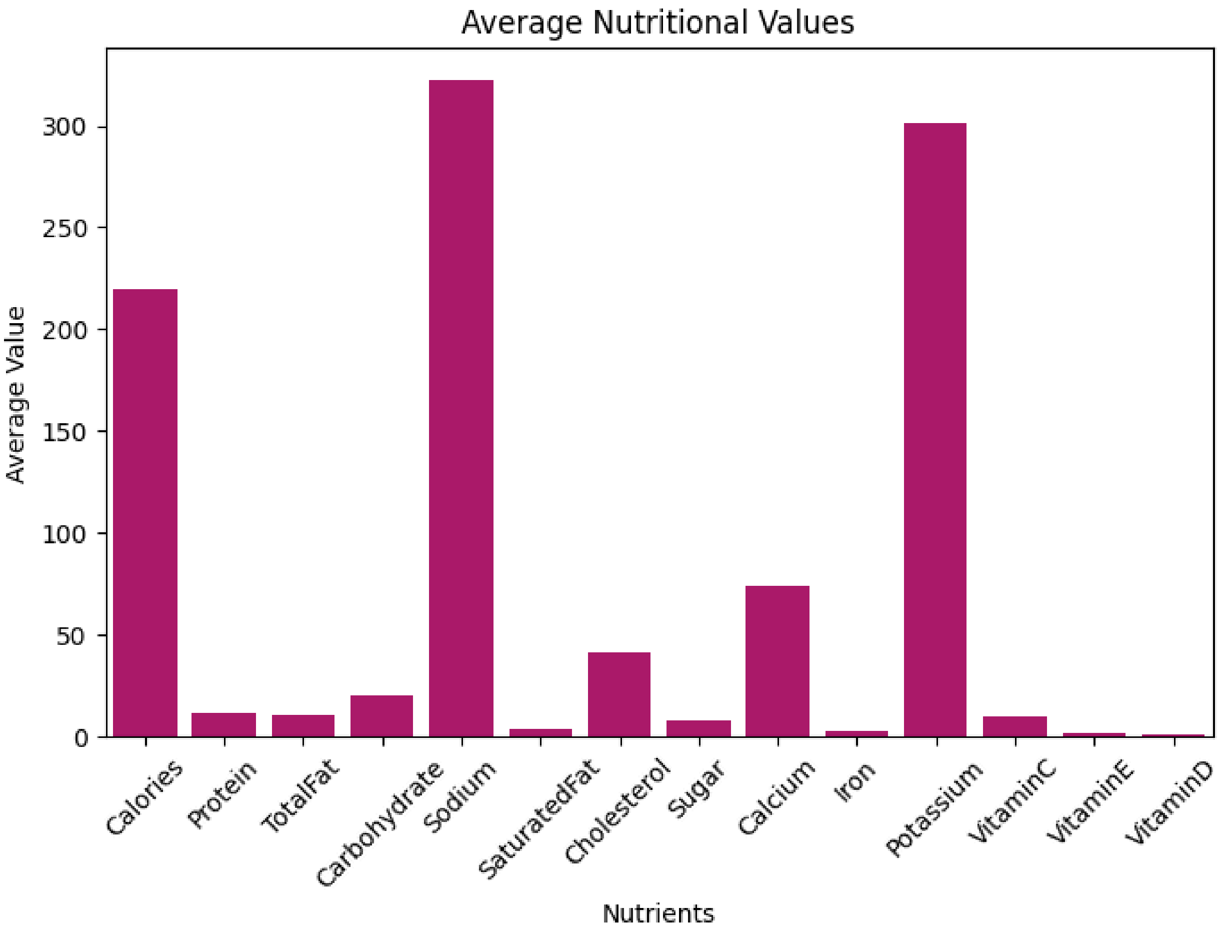
Out[14]:

	0
Calories	219.695338
Protein	11.710368
TotalFat	10.320614
Carbohydrate	20.697860
Sodium	322.059220
SaturatedFat	3.452267
Cholesterol	41.551994
Sugar	8.256540
Calcium	73.530627
Iron	2.828368
Potassium	301.357949
VitaminC	9.435980
VitaminE	1.487462
VitaminD	0.576918

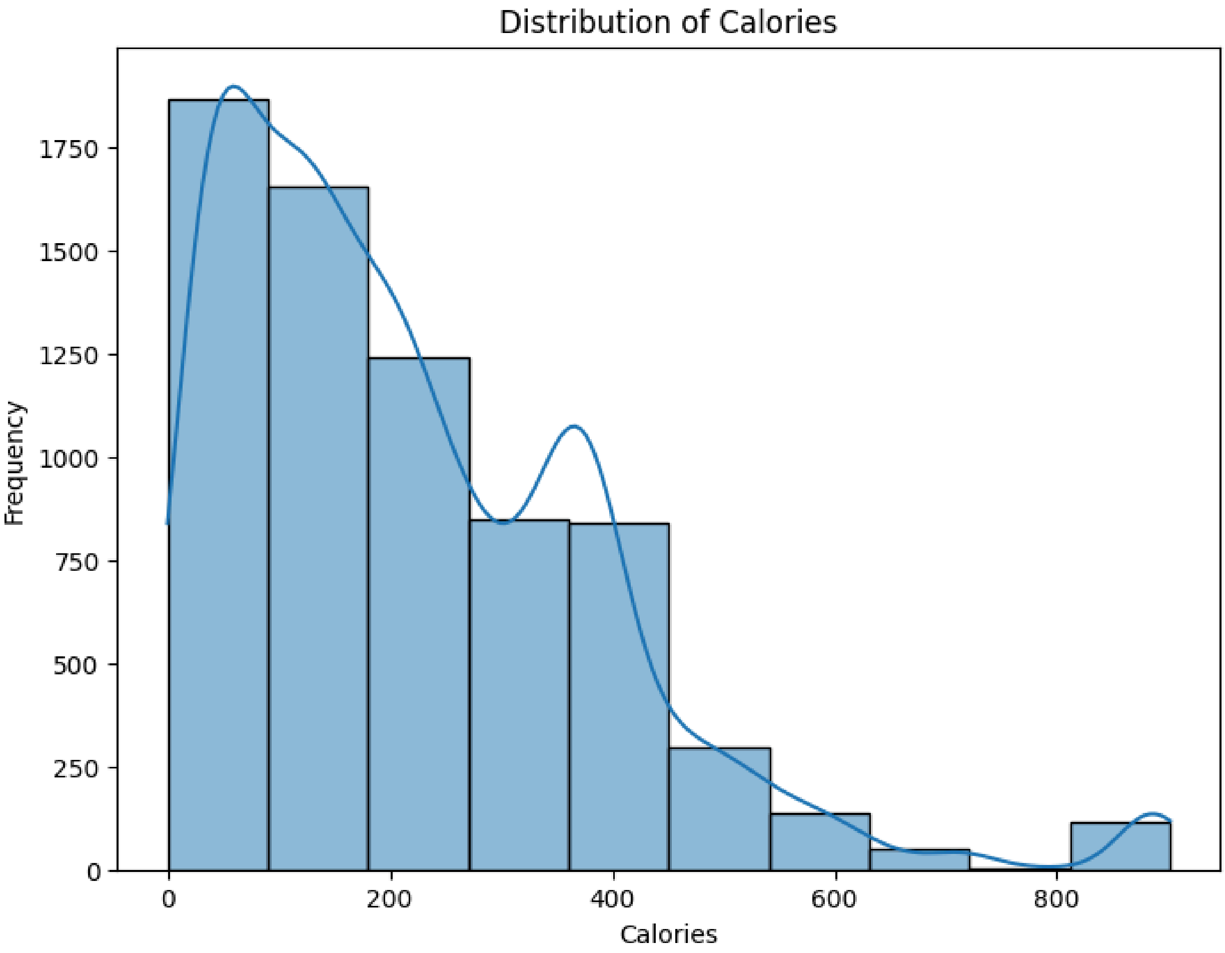
dtype: float64

In [21]:

```
plt.figure(figsize=(8, 5))
sns.barplot(x=avg_values.index, y=avg_values.values,color='#c2026d')
plt.xticks(rotation=45)
plt.xlabel('Nutrients')
plt.ylabel('Average Value')
plt.title('Average Nutritional Values')
plt.show()
```



```
In [25]: plt.figure(figsize=(8, 6))
         sns.histplot(data['Calories'], bins=10, kde=True)
         plt.xlabel('Calories')
         plt.ylabel('Frequency')
         plt.title('Distribution of Calories')
         plt.show()
```



```
In [26]: df1.corr()
```

Out[26]:

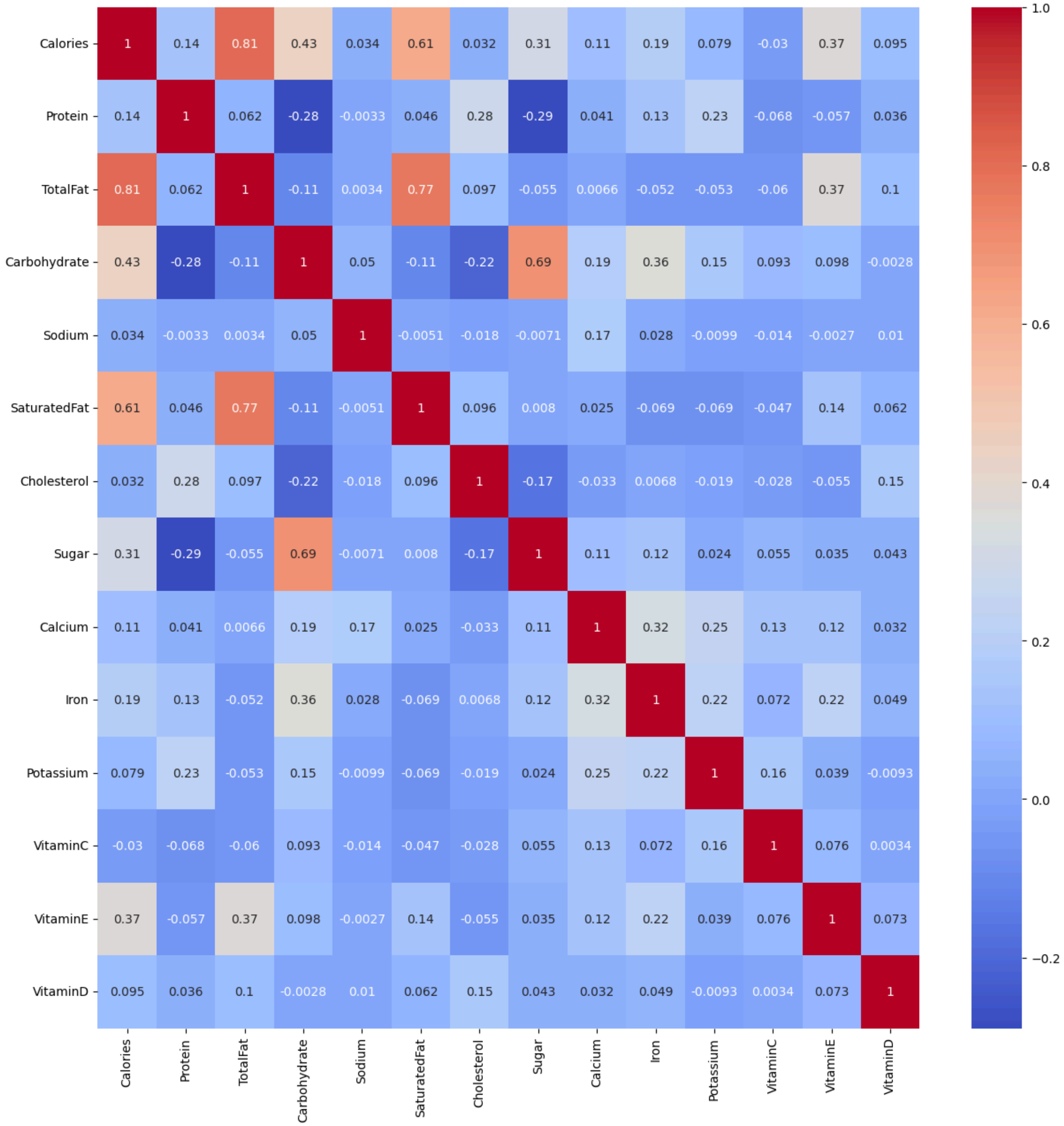
	Calories	Protein	TotalFat	Carbohydrate	Sodium	Saturate
Calories	1.000000	0.135258	0.807770	0.434701	0.033703	0.61
Protein	0.135258	1.000000	0.061682	-0.284500	-0.003253	0.04
TotalFat	0.807770	0.061682	1.000000	-0.109399	0.003390	0.76
Carbohydrate	0.434701	-0.284500	-0.109399	1.000000	0.049544	-0.10
Sodium	0.033703	-0.003253	0.003390	0.049544	1.000000	-0.00
SaturatedFat	0.611601	0.045784	0.766142	-0.108676	-0.005075	1.00
Cholesterol	0.032433	0.280578	0.097111	-0.216070	-0.018348	0.09
Sugar	0.309989	-0.289221	-0.055459	0.688422	-0.007078	0.00
Calcium	0.112560	0.041071	0.006585	0.187122	0.174784	0.02
Iron	0.192506	0.133609	-0.051781	0.362023	0.027904	-0.06
Potassium	0.078807	0.225451	-0.052801	0.148615	-0.009881	-0.06
VitaminC	-0.029628	-0.067523	-0.059612	0.093021	-0.013911	-0.04
VitaminE	0.365777	-0.057482	0.370318	0.097550	-0.002742	0.13
VitaminD	0.095231	0.035705	0.100754	-0.002758	0.010261	0.06

In [27]:

```
plt.figure(figsize=((15,15)))
sns.heatmap(df1.corr(),cmap='coolwarm', annot=True)
```

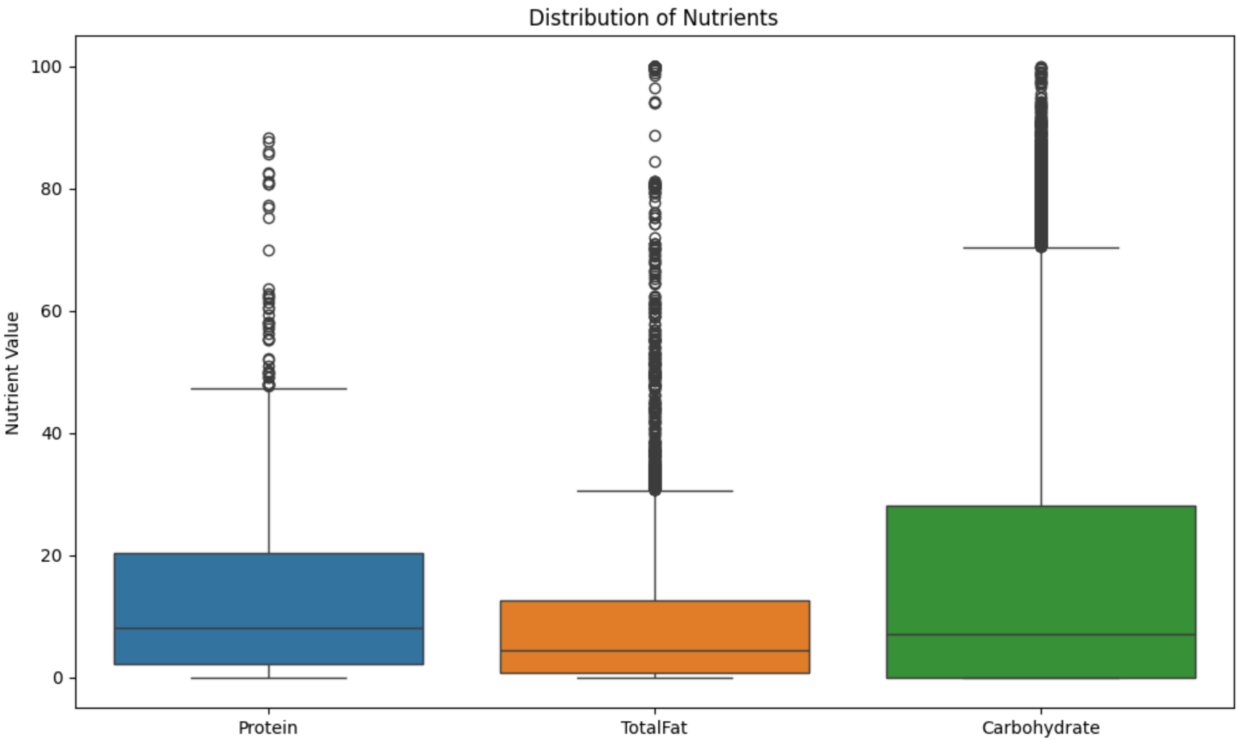
Out[27]:

```
<Axes: >
```



In [32]:

```
plt.figure(figsize=(12, 7))
sns.boxplot(data=data[['Protein', 'TotalFat', 'Carbohydrate']])
plt.ylabel('Nutrient Value')
plt.title('Distribution of Nutrients')
plt.show()
```



missing values

In [34]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7058 entries, 0 to 7057
Data columns (total 15 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   Description   7058 non-null   object 
 1   Calories      7057 non-null   float64
 2   Protein       7057 non-null   float64
 3   TotalFat      7057 non-null   float64
 4   Carbohydrate  7057 non-null   float64
 5   Sodium        6974 non-null   float64
 6   SaturatedFat  6757 non-null   float64
 7   Cholesterol   6770 non-null   float64
 8   Sugar         5148 non-null   float64
 9   Calcium       6922 non-null   float64
 10  Iron          6935 non-null   float64
 11  Potassium     6649 non-null   float64
 12  VitaminC      6726 non-null   float64
 13  VitaminE      4338 non-null   float64
 14  VitaminD      4224 non-null   float64
dtypes: float64(14), object(1)
memory usage: 827.2+ KB
```

In [35]:

```
data.isna().sum()
```

Out[35]:

	0
Description	0
Calories	1
Protein	1
TotalFat	1
Carbohydrate	1
Sodium	84
SaturatedFat	301
Cholesterol	288
Sugar	1910
Calcium	136
Iron	123
Potassium	409
VitaminC	332
VitaminE	2720
VitaminD	2834

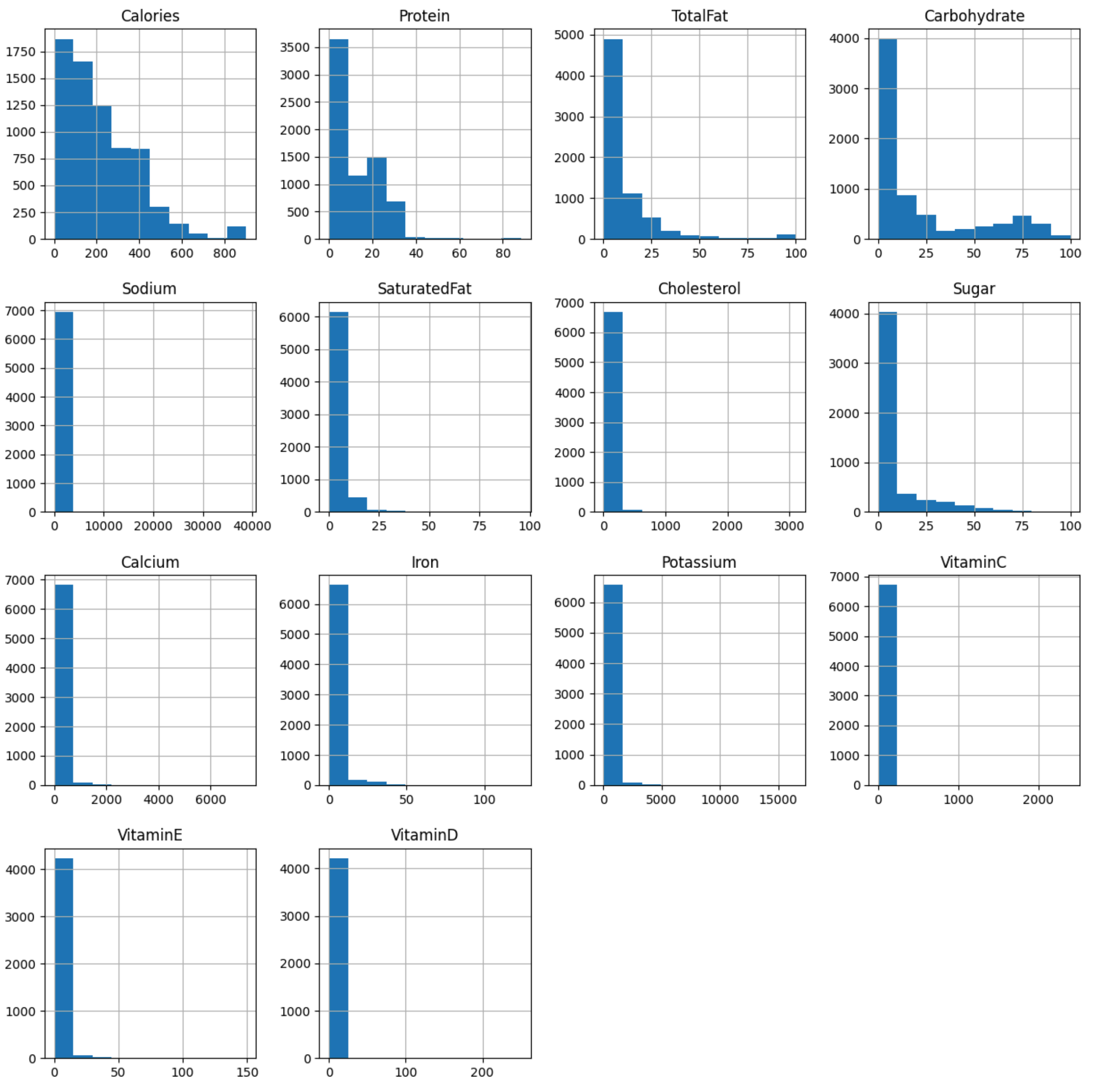
dtype: int64

In [37]:

```
data.hist(figsize=((15,15)))
```

Out[37]:

```
array([[<Axes: title={'center': 'Calories'}>,
        <Axes: title={'center': 'Protein'}>,
        <Axes: title={'center': 'TotalFat'}>,
        <Axes: title={'center': 'Carbohydrate'}>],
       [<Axes: title={'center': 'Sodium'}>,
        <Axes: title={'center': 'SaturatedFat'}>,
        <Axes: title={'center': 'Cholesterol'}>,
        <Axes: title={'center': 'Sugar'}>],
       [<Axes: title={'center': 'Calcium'}>,
        <Axes: title={'center': 'Iron'}>,
        <Axes: title={'center': 'Potassium'}>,
        <Axes: title={'center': 'VitaminC'}>],
       [<Axes: title={'center': 'VitaminE'}>,
        <Axes: title={'center': 'VitaminD'}>, <Axes: >, <Axes: >]],
      dtype=object)
```



```
In [38]: data.columns
```

```
Out[38]: Index(['Description', 'Calories', 'Protein', 'TotalFat', 'Carbohydrate',
                'Sodium', 'SaturatedFat', 'Cholesterol', 'Sugar', 'Calcium', 'Iron',
                'Potassium', 'VitaminC', 'VitaminE', 'VitaminD'],
               dtype='object')
```

```
In [39]: for i in ['Calories', 'Protein', 'TotalFat', 'Carbohydrate',
                 'Sodium', 'SaturatedFat', 'Cholesterol', 'Sugar', 'Calcium', 'Iron',
                 'Potassium', 'VitaminC', 'VitaminE', 'VitaminD']:
             data[i] = data[i].fillna(data[i].median())
```

```
In [41]: data.isna().sum()
```

Out[41]:

	0
Description	0
Calories	0
Protein	0
TotalFat	0
Carbohydrate	0
Sodium	0
SaturatedFat	0
Cholesterol	0
Sugar	0
Calcium	0
Iron	0
Potassium	0
VitaminC	0
VitaminE	0
VitaminD	0

dtype: int64

In [42]:

```
data.head(10)
```

Out[42]:

	Description	Calories	Protein	TotalFat	Carbohydrate	Sodium	Sat
0	BUTTER,WITH SALT	717.0	0.85	81.11	0.06	714.0	
1	BUTTER,WHIPPED,WITH SALT	717.0	0.85	81.11	0.06	827.0	
2	BUTTER OIL,ANHYDROUS	876.0	0.28	99.48	0.00	2.0	
3	CHEESE,BLUE	353.0	21.40	28.74	2.34	1395.0	
4	CHEESE,BRICK	371.0	23.24	29.68	2.79	560.0	
5	CHEESE,BRIE	334.0	20.75	27.68	0.45	629.0	
6	CHEESE,CAMEMBERT	300.0	19.80	24.26	0.46	842.0	
7	CHEESE,CARAWAY	376.0	25.18	29.20	3.06	690.0	
8	CHEESE,CHEDDAR	403.0	24.90	33.14	1.28	621.0	
9	CHEESE,CHESHIRE	387.0	23.37	30.60	4.78	700.0	

label Encoding

In [43]:

```
data.nunique()
```

Out[43]:

	0
Description	7054
Calories	655
Protein	2415
TotalFat	2151
Carbohydrate	2758
Sodium	1196
SaturatedFat	3213
Cholesterol	287
Sugar	1566
Calcium	498
Iron	926
Potassium	885
VitaminC	529
VitaminE	485
VitaminD	113

dtype: int64

Scaling

In [77]:

```
from sklearn.preprocessing import MinMaxScaler
minmax = MinMaxScaler()
```

In [78]:

```
y = data['Description']
```

In [79]:

```
x = data.drop('Description',axis=1)
```

In [80]:

```
newx = minmax.fit_transform(x)
```

In [81]:

```
type(newx)
```

Out[81]:

```
numpy.ndarray
```

```
In [82]: df = pd.DataFrame(newx,columns=['Calories', 'Protein', 'TotalFat', 'Carbohydra
                'Sodium', 'SaturatedFat', 'Cholesterol', 'Sugar', 'Calcium', 'Iron',
                'Potassium', 'VitaminC', 'VitaminE', 'VitaminD'])
```

```
In [83]: df = pd.concat([y,df],axis=1)
         df
```

Out[83]:

	Description	Calories	Protein	TotalFat	Carbohydrate	
0	BUTTER,WITH SALT	0.794900	0.009624	0.8111	0.0006	(
1	BUTTER,WHIPPED,WITH SALT	0.794900	0.009624	0.8111	0.0006	(
2	BUTTER OIL,ANHYDROUS	0.971175	0.003170	0.9948	0.0000	(
3	CHEESE,BLUE	0.391353	0.242301	0.2874	0.0234	(
4	CHEESE,BRICK	0.411308	0.263134	0.2968	0.0279	(
...	...	...	...	...	...	
7053	FROG LEGS,RAW	0.080931	0.185688	0.0030	0.0000	(
7054	MACKEREL,SALTED	0.338137	0.209466	0.2510	0.0000	(
7055	SCALLOP,(BAY&SEA),CKD,STMD	0.123060	0.232563	0.0084	0.0541	(
7056	SNAIL,RAW	0.099778	0.182292	0.0140	0.0200	(
7057	TURTLE,GREEN,RAW	0.098670	0.224185	0.0050	0.0000	(

7058 rows × 15 columns

Takeways- -Histogram plots represents the distributions of nutrient values, revealing spread and skewness.

-Boxplots indicate varying ranges and outliers for Protein, Total Fat, and Carbohydrate.

-Strong positive correlation between Calories and Total Fat (0.808), and Total Fat and Saturated Fat (0.766).

-Moderate positive correlation between Carbohydrate and Calories (0.435), and negative correlation with Protein (-0.285).

-Sodium has relatively low correlations with other nutrients.

Average Nutrient Values: -Calories, Total Fat, and Sodium have the highest average values.

-Vitamin E and Vitamin D have relatively low average values compared to other nutrients.